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Patent

IN THE UNITED STATES RECEIVING OFFICE (RO/US)

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International	International	Priority Date
Application No.	Filing Date	Claimed

"WEAR RESISTANT GRINDING MACHINE COMPONENTS"
Title of Invention

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Applicant(s) For RO/US

COPY

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RESPONSE TO WRITTEN OPINION

Dear Sir:

This letter accompanies substitute sheets which have been amended from the originally filed claims in order to comply with the objections and rejections in the Written Opinion dated 26 April 2004. Applicants would like to draw attention to the differences between the replaced sheets and the substitute sheets, as well as explaining the reasons for the amendments, as follows.

FACSIMILE MAIL CERTIFICATE

Date of Deposit: June 28, 2004

I hereby certify that the following attached papers and/or fee are being deposited with both the International Bureau of WIPO on the date indicated above via facsimile to the facsimile number of record, i.e. 011-41-22-740-14-35, and the Assistant Commissioner for Patents, Box PCT, on the date indicated above via facsimile to the facsimile number of record, i.e. 703-305-3230, and is addressed to "International Bureau of WIPO, 34, chemin des Colombettes, 1211 Geneva 20, Switzerland, Facsimile No. 011-41-22-740-14-35", and "Mail Stop PCT, Commissioner for Patents, Attention: IPEA/US, Examiner Ling X. Xu, PO Box 1450, Alexandria VA 22313-1450, Facsimile No. 703-305-3230".

Nancy L. Craft

Name

Signature

As a majority of the claims have been amended, the three substitute sheets which are enclosed herein reflect the changes which have been made. First, in order to have claim 1 meet the criteria under PCT Article 33(2), the claims have been limited to recitation of solid components made of ceramic and cermet materials. Traditional grinding wheel components have been made of steel, and until now, traditional grinding technology did not permit feasible manufacturing of ceramic/cermet components.

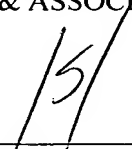
Therefore, it is submitted that claims 1 through 14 recite an invention with novelty and an inventive step, and they are not obvious over Naumann et al (US 5,916,013), as that reference merely mentions electroplated/plated and/or brazed boron nitride coatings over high tensile steel components (see especially 1/38-42, 8/50, 8/66-67, 9/5-10, and 12/45). The present invention is most interested in maintaining the rigidity of the ceramic/cermet components, which lead to a grinding machine capable of reproducibly making extremely high tolerance work products. The use of steel in the body of the components can lend an unacceptable level of flexibility, which can destroy such a high tolerance.

Applicants were pleased to note that claim 1 was found to have industrial applicability under PCT Article 33(4).

Applicants submit, after making these amendments, no new matter has been injected and that all defects have been corrected and that novelty, inventive step, and industrial applicability criteria have been met for all 14 resulting claims. Any questions may be directed to the below-named attorney of record. Thank you in advance for your kind consideration of this matter.

Very truly yours,

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PCT/US2003/024165

CLAIMS

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What is claimed is:

- 5 1. A wear resistant grinding machine component, comprising:
 a grinding machine component made of a solid ceramic material selected
 from the group consisting of carbides, nitrides, oxides, borides, cermets, carbonitrides, and
 combinations thereof.
- 10 2. An extremely high precision wear resistant grinding machine
 component for a high precision centerless grinding machine, comprising:
 a grinding machine component made of a solid piece of an extremely
 rigid and very hard, non-flexing material selected from the group consisting of ceramics,
 carbides, nitrides, borides, oxides, oxynitrides, carbonitrides, alumina, cermets, nitrides,
15 borides, oxides, and combinations thereof,
 wherein the grinding machine component may include the entire
 component being made of a ceramic material, a sleeve of solid ceramic material adhered over
 a metallic substrate base, and a grinding machine component made of a cermet material,
 formed into a grinding machine component.
- 20 3. The grinding machine component of claim 1, wherein the grinding
 machine component is selected from the group consisting of tension rods, transfer ways,
 spindles, spindle housings, pivot rods, threaded shaft rods, concentric shaft seals, lead screws,
 and combinations thereof.
- 25 4. The grinding machine component of claim 1, wherein the grinding
 machine component is non-flexing and maintains a very high tolerance of from about
 0.000005 inch to about 0.000030 inch.
- 30 5. The grinding machine component of claim 1, wherein the grinding
 machine component enables a repeatability factor of from about 0.000005 inch to about
 0.000030 inch.

6. The grinding machine component of claim 1, wherein the grinding machine component is made of a metallically infiltrated cermet material made from a spongy ceramic and then infiltrated with a molten metal which is thereafter allowed to solidify within the matrix of the spongy ceramic.

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7. The grinding machine component of claim 1, wherein the grinding machine component further includes a metallic component incorporated into the ceramic material to increase the strength of the component.

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8. The grinding machine component of claim 7, wherein the grinding machine component further includes a metallic component in the ceramic material selected from the group consisting of cobalt, vanadium, chromium, manganese, nickel, copper, zinc, molybdenum, cadmium, indium, tin and combinations thereof.

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9. The grinding machine component of claim 7, wherein the grinding machine component further includes the metallic component in a concentration of from about 1 to about 50 percent by weight.

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10. The grinding machine component of claim 1, wherein the ceramic grinding machine component further includes a magnetic component including a component selected from the group consisting of powdered iron, niobium, yttrium and combinations thereof.

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11. The grinding machine component of claim 10, wherein the grinding machine component further includes the magnetic component in a concentration of from about 1 to about 25 percent by weight.

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12. The grinding machine component of claim 1, wherein the grinding machine component may be formed into a grinding machine component by forming a hard surface layer by a method selected from the group consisting of carburizing and carbonitriding.

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13. The grinding machine component of claim 12, wherein the grinding machine component formed into a grinding machine component by carburizing is accomplished by carburizing by a method selected from the group consisting of gas

carburizing by placing in a carburizing gaseous atmosphere, pack carburizing by placing all the surfaces in contact with a solid compound, and combinations thereof.

14. The grinding machine component of claim 12, wherein the grinding
5 machine component is formed into a grinding machine component by carbonitriding by dissociating ammonia into hydrogen and nitrogen.